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**WILLIAM STANLEY JEVONS: A PIONEERING THINKER
ON ECOLOGICAL TAXATION**

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Abstract
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By making energy transition the focus of investments for the future and introducing a new carbon tax, the French government has placed environmental issues firmly on the political agenda. Among the measures taken to tackle this agenda, ecological taxation has been prominent, especially since the Constitutional Council blocked the first carbon tax mechanism in late 2009. From its first formulation to its temporary abandonment in spring 2010, carbon taxation has generated heated debate in the country, which has sometimes been highly technical but has often looked beyond taxation issues proper to consider questions of social justice and international competitiveness.

Although the challenge of climate change, which underlies the rationale for ecological taxation, is a recent feature of industrial history, the idea of taxing energy or its derivatives to discourage waste and prevent the exhaustion of resources is not a new one. It is found in the economic literature of the mid-nineteenth century, when observers of the industrial revolution realized that the development of manufacturing involved the ever-growing use of both surface and subsurface resources. This was the age of coal in Great Britain as well as in continental Europe. To take just one example, between 1775 and 1865, coal production in Great Britain increased from 8.9 to 102.3 million tons (Flinn 1984, Church 1986), a massive factor of eleven.

William Stanley Jevons (1835-1882), a professor of economics in Manchester and London in the 1860s and 1870s, was one of the observers of that era. A few years before publishing *The Theory of Political Economy* (1871), which laid the foundations of marginalism in economics,¹ he decided in 1865 to devote a long monograph to coal: *The Coal Question; An Inquiry Concerning the Progress of the Nation and the Probable Exhaustion of Our Coal Mines*. In this work, which was soon released as a second edition in 1866, he reviewed the state of geological knowledge of available coal reserves, offered his own diagnosis

of the past and future evolution of energy consumption, challenged the optimism of the engineers of his day, who in his view showed excessive confidence in the future improvement of production processes, and shared his fears over the future of the British economy he saw as soon to be asphyxiated by a mineral becoming increasingly scarce and therefore expensive.

Although Jevons's contribution in *The Coal Question* to economic theory as a whole was relatively modest, it is of unexpected interest to a student of the nineteenth century investigating the challenges posed by ecological taxation. Jevons devoted a small part of his study to assessing the requirements and outcomes as well as the pros and cons of imposing a general tax on coal, which some political circles were advocating to reduce its use and slow its depletion. As a surprising precursor of modern concerns, Jevons covered the same arguments in 1865 that we hear today. He wrote about the environmental, social, economic, administrative, and political challenges involved in imposing a tax on coal, many of which remain familiar. Although his target – resource exhaustion – is in a sense different from the today's climate-related challenges, he is not alone in interweaving the importance of ecological issues. Jevons's thinking thus allows us to take a useful step back in a context where immediate concerns often drive long-term decisions, which we review in detail below.

The Environmental and Economic Objective of Ecological Taxation

When Jevons was writing, Great Britain was the most prolific producer and exporter of coal in the world. Renowned for its abundance and quality, British coal had many household and industrial uses (including heating, motive power, and driving machinery) and was exported to every corner of the globe. For Jevons, the special characteristics of British coal made it a hugely valuable and irreplaceable natural resource. The opening line of *The Coal Question* emphasizes this uniqueness: "Day by day it becomes more evident that the coal we happily possess in excellent quality and abundance is the mainspring of modern material civilization" (Jevons 1866, 1).

Although some were beginning to look at the

¹ Formulated jointly by British economist William Stanley Jevons, Austrian economist Carl Menger, and French economist Léon Walras, marginalism is an economic approach that focuses on calculation "at the margin" based on the notion of marginal utility. The theory states that the value of a good depends on the usefulness or happiness derived from consuming an additional unit of it, not on total or average consumption.

possibility of using oil² or developing electricity, Jevons defended the view that coal had no substitute (1866, 165–6), partly due to its calorific value (156–7, 163) and partly for technical and logical reasons. Although electricity can transmit energy, that energy first has to be produced by burning coal and thus can supplement but not replace coal itself (140–1). Although history was to prove Jevons wrong with the gradual replacement of coal by hydrocarbons and nuclear power, his position can be explained by the state of the technology available in the 1860s and by the very high dependence of the entire productive mechanism in Great Britain on coal. At the time, the diagnosis was relatively simple: coal is the lever of economic development, but it is running out; we therefore need to find a way to preserve it. The notion of safeguarding the environment was only tangential in this discourse since it was mainly for economic reasons that natural resources were said to need protection.

Among the methods advanced for preserving it, a coal tax was often suggested as an option, with varying scope, ranging from taxing all extraction to simply applying export duties. Jevons saw the indisputable advantages of imposing such a tax since it would slow resource extraction and thus its rate of depletion, offer a new way of filling the public coffers, and weaken foreign industries that needed British coal (1866, 355). These arguments – or at least the first two – bring to mind those used by advocates of carbon taxation in the twenty-first century. Preserving natural spaces and resources by setting up a green investment fund from the taxes collected are recurring themes in the discourse of pro-ecological taxation. Yet in his own context, Jevons was not totally convinced of the long-term benefit or immediate feasibility of a coal tax. There too, the counter-arguments are not foreign to us.

Risk of Loss of Competitiveness

For Jevons, the main problem was that a coal tax would increase production costs. As coal was the basis of all industrial processes, it amounted to a diffuse cost affecting all economic activities. Thus increasing the cost of coal by taxing it would

² The first commercial oil well was brought into production in Titusville, Pennsylvania, in 1859 (see Copinschi 2012).

increase the price of all goods. As Jevons expressed it, “through coals, we shall be taxed in everything and at every moment” (1866, 361). Moreover, this price inflation would be cumulative as coal was needed at every stage of the production of a good, and this would multiply the weight of taxation since “most things will be taxed over and over again at each stage of manufacture” (361). Consequently, not only would the production costs of heavy industry rise, but so would all costs and prices of all goods. In today’s language, Jevons was arguing that a tax on coal would lead to a general decline in purchasing power for all consumers and that the entire economy would suffer.

Should we therefore, in the name of safeguarding a resource, weaken all economic sectors? Jevons had doubts, and these support the arguments of those who today highlight the recessionary impact of imposing a carbon tax. In its working document of April 2013, the Coe-Rexecode Institute argues that introducing a carbon tax would have “a clearly recessionary effect since Gross Domestic Product (GDP) would be 0.03% to 0.17% lower than in the no-carbon-tax reference scenario” (Scapecchi 2013, 16). Such macro-economic effects can be seen as the collateral impact of a fiscal instrument aiming for a higher purpose, namely safeguarding the environment. Yet in the context in which Jevons was writing, where the only legitimate issue was national prosperity, it is not surprising that these concerns were central to debates. As to whether they have relevance today in a historical context that has greatly evolved since then and offers space for environmental concerns, the question remains open.

On the same theme but on a different level, Jevons shares his unease about the imposition of a coal tax in Great Britain alone. Although he does not refer explicitly to the loss of competitiveness, this is clearly what he is uneasy about. General price inflation affecting all goods as a result of the imposition of a coal tax would make British manufactured goods more expensive (1866, 360) and therefore more difficult to export compared to French, German, or even American goods, and British industrial advantages would be weakened worldwide (74). In this sense, a tax on coal does not lessen the economic difficulties resulting from the exhaustion of natural resources (rising energy prices, loss of purchasing power) but only brings them forward by increasing the price of coal before coal nears exhaustion.

The theme of competitiveness sketched out by Jevons is a key argument used today by opponents of carbon taxation. In March 2010, when the French government decided to abandon its carbon tax plan, it used this argument to do so, as evidenced by Prime Minister François Fillon's words in the National Assembly: "The decisions we make for sustainable development must be better coordinated with all European countries in order not to deepen our non-competitiveness."³ Although the notion of international coordination on ecological taxation is far removed from Jevons's concerns, his case against weakening a national economy against its competitors seems to have resurfaced a hundred and fifty years later.

In the initial 2009 version of the French plan, broad carbon-tax exemptions were provided for the most exposed industries, which also had access to the European carbon quota trading system. It was these types of exemptions that the Constitutional Council struck down as inadequate and unfair. Yet this too has a long history. Jevons pointed out that since the late eighteenth century, proposals for taxing coal included exemptions, such as those introduced by British Prime Minister William Pitt in 1784. Pitt's plan provided for a small tax on coal consumption, with an exemption for "all factories largely consuming coal" (1866, 362). Here again, ecological taxation in the twenty-first century seems to represent a profound historical revival.

On the economic and competition front, Jevons's thinking offers useful insights. Energy is economically a strategic issue, whether it be mining in the nineteenth century or burning fossil fuels in the twenty-first. In both cases, the rise in the price of energy caused by taxation creates concerns over purchasing power, production costs, and competitiveness. This discourse has stood the test of time, and advocates of ecological taxation do not seem to have yet marshaled sufficiently powerful arguments to discredit it.

Administrative Obstacles

Exempting selected industries from an ecological tax can pose political problems, as the Constitutional Council's rejection of the carbon tax

³ François Fillon's reply to Jean-François Copé, March 23, 2010 (available at: www.assemblee-nationale.fr).

bill in France shows.⁴ However, it can also pose practical problems, such as setting up administrative mechanisms to decide who can or cannot be exempted and to check that exemptions are not fraudulent or misused. Jevons underscores this aspect by remarking that it is very complicated for public authorities to decide at any point in time whether a particular ton of coal should be taxed based on its intended use, noting that "to discriminate the coal used for different purposes would be a difficult or impossible task for the Inland Revenue department" (362).

Moreover, administrative hurdles do not stop there, Jevons argued. Coal exists in numerous forms and with diverse qualities. Does it make sense to tax all these varieties equally at the risk of rendering some coalfields unprofitable while benefiting others? Jevons is not convinced, mainly due to the risk of distorting markets this introduces: "Coal differs so much in kind, quality, and size that a uniform tax would be prohibitory of the use of small or inferior coals, and great quantities would be lost and burnt upon the waste heaps." (362)

Clearly, a tax should not privilege some economic players to the detriment of others but instead place an equal relative burden on all players in a given market. Its purpose is to change the behavior of all players, not to provide an opportunity for some to improve their competitive position without expending any effort. To prevent such distortion, different grades of coal would need to be taxed differently, with all its administrative implications, which is why Jevons was skeptical about the viability of such a mechanism.

This type of argument based on administrative feasibility has recently been used in European discussions over taxing goods by carbon intensity, which is difficult to measure especially when the goods include imported components. This was echoed by the World Bank in 2010 when assessing the obstacles to setting up ecological customs barriers: "It would be . . . extremely difficult to measure exactly the carbon content [of imported goods], and the results obtained could be challenged." (World Bank 2009, 252)

Here again, there are points in common between

⁴ The Constitutional Council rejected the French carbon tax mechanism on December 29, 2009, essentially on the grounds that it breached the principle that taxation should be evenly and fairly borne (Conseil Constitutionnel 2009).

debates taking place in the mid-nineteenth century and those taking place today. Thus it is not just economic arguments but also administrative ones that make historical thinking relevant today.

The Need for Redistribution

Yet a more sensitive aspect, namely the issue of social justice, is central to thinking about ecological taxation. In *The Coal Question*, Jevons had to justify his position from two angles: an economic angle, warning his contemporaries of the threat posed to Great Britain's prosperity by the exhaustion of natural resources, and a social angle, highlighting the intergenerational injustice that the overexploitation of natural wealth could create, depriving future generations of the ability to use them. What Jevons was in fact saying was that natural resources do not belong to one generation any more than to another. However, with some resources, including coal, what is used today is no longer available tomorrow. A coalfield that is used up is used up for good. Thus thoughts about preserving resources are inseparable from considerations of intergenerational justice.

What is therefore the role of ecological taxation from this perspective? On this point, Jevons shifts his position on a general tax on coal. He calls on the public purse to ensure intergenerational solidarity but by using a very different instrument, namely the reduction of public debt: "The only suggestion I can make towards compensating posterity for our present lavish use of cheap coal is one that it requires some boldness to make. I mean the reduction or paying off of the National Debt" (Jevons 1866, 364–5).

His reasoning is as follows. Because coal is running out, it will become increasingly expensive and an ever increasing burden on the economic development of future generations. Today's generations cannot allow themselves to leave behind a heritage of expensive coal and a massive public debt to boot. The task ahead of them is to enjoy their own prosperity but also to straighten out the public finances and to use natural resources reasonably. As Jevons argued in January 1867 in a lecture at Carpenters' Hall in Manchester: "We must use our wealth as it ought to be used. If we use it in mere luxury and mismanagement, . . . we shall be justly blamed; but if we use it in improving the condition of everyone, . . . if we use it in

providing education, in improving the dwellings, . . . to do away with pauperism, and to provide libraries and institutions or anything that will increase the power and improve the character of our people, then I think we shall never be blamed for using our coal too fast" (Jevons 1867, 27–8).

Here, his analysis leaves the narrow ground of ecological taxation and addresses environmental issues and redistribution. In calling on local authorities to invest in both tangibles (infrastructure) and intangibles (education), Jevons is sketching out what could be called an intergenerational redistribution system offering present generations abundant and cheap natural resources and future generations new infrastructures and intellectual skills. However, this mechanism comes up against fundamental problems, which are widely discussed in economic and ecological theory, namely the possibility of substituting (or not) infrastructures for natural resources.⁵ Regardless, Jevons clearly links his environmental thinking to redistributive measures, a connection that remains strong today.

Since the 1970s–1980s and the first warnings about climate change, the environmental discourse has focused on the long-term effects of public policy. This is because we now recognize that any greenhouse gas emission into the atmosphere will have an impact not only today but also in decades to come. Quantifiable long-term targets have thus emerged, including the recommendation of the Intergovernmental Panel on Climate Change (IPCC) not to allow global temperatures to rise by more than 2°C by 2050. The implementation of ecological measures, notably through taxation, is in line with this type of objective, which focuses not only on present generations but also – and primarily – on future generations. Sacrifices made today in financial terms (through investment and energy taxes) and technical restrictions (such as environmental standards) should ensure a sustainable lifestyle for future generations. The notion of intergenerational solidarity is thus taking center stage in twenty-first-century thinking, reflecting arguments developed in the nineteenth century. Note also that this intergenerational discourse has also been used in Europe since the 2000s to call for a reduction in public debt, with people clamoring today for collective efforts to ease

⁵ This is the debate over strong versus weak sustainability in ecological economics.

the debt burden bequeathed to future generations, thus reinforcing the continuing relevance of Jevons's insights.

On the societal level, the convergence between nineteenth-century concerns and twenty-first-century challenges is as unmistakable economically as administratively. Jevons even seems to be ahead of us when he links the future of the environment to public debt, two concerns that remain disconnected today despite their similar intergenerational consequences.

Exhaustion of Resources and Climate Change

Ever since the industrial revolution, economic activity has often been at loggerheads with the environment. In the nineteenth century, the depletion of energy resources began to create concerns. In the first half of the twentieth century, it was pollution (rivers, urban smog) that created problems for both natural environments and humans, while in the 1960s and 1970s, the specter of resource exhaustion resurfaced, as did climate change in the 1980s. Today, it is this panoply of concerns that twenty-first-century generations are inheriting. As a result, the need for policy decisions is becoming increasingly pressing. Ecological taxation is an instrument conducive to the exchange of ideas as it involves environmental, political, economic, and social considerations. Underlying these many considerations is a long history of related discourse, making yesterday's arguments relevant today even though the challenges have changed.

William Stanley Jevons's role in this history is significant and shows the resurgence of arguments surrounding ecological taxation. In 1865, this concern led him to investigate the probable exhaustion of coal. Today, climate change requires us to set up carbon mechanisms that for the most part have not yet been invented. However, in both of these situations, even a hundred and fifty years apart, the same factors are cited to support or discredit the taxation option. Is this legitimate, and does it at least make sense? In a sense, the answers to both questions are affirmative because all environmental problems are interrelated. It is because we burned a massive amount of coal and hydrocarbons in the nineteenth and twentieth centuries that we are running out of them and our air now contains a critical amount of carbon. Yet

beyond this connection, is it rational to use the same arguments to assess the wisdom of a general coal tax in 1865 and a carbon tax in 2013? That is the critical issue.

The first fundamental difference is the fact that coal and carbon do not have the same market status. Before even beginning to talk about taxation, we need to understand that coal has a price as a resource bought and sold in a market. Carbon is different. Until public taxation or market mechanisms are set up, carbon has no price. Consequently, whereas the coal tax Jevons envisaged is a surcharge on a pre-existing valuation, a carbon tax is a new price for a new good.

This subtle conceptual distinction is not trivial. For coal, this means that if like Jevons we see it as a shrinking resource, its price increases, while a tax can only bring forward any future price increase. Rather than rising mechanically to reflect increasing scarcity, prices rise artificially today due to the tax. Hence Jevons's warnings of the proliferation of economic problems such a rise could generate.

In the case of carbon, what would be taxed is not the energy source but its carbon content. Although the price rise effect seems identical to the rise we saw for hydrocarbon resources, it is non-existent for all non-fossil fuels as these are exempt from tax. Consequently, a carbon tax not only reduces the consumption of fossil fuels but also—and above all—encourages the use of non-fossil fuels. In Jevons's day, coal was the only industrially viable source of energy. However, this is no longer the case today. Consequently, the argument that the tax will increase the price of all goods thereby reducing consumers' purchasing power needs to be qualified to take into account the world we know, not that of Jevons. Today, we can switch to zero-carbon—or at least low-carbon—production processes and goods and thus avoid the tax. This is a difference from the nineteenth century that relativizes arguments over the recessionary character of today's ecological taxation.

Another difference between yesterday's and today's challenges is that Jevons's concerns were mainly – though not exclusively – economic. Britain's prosperity was the central concern, overriding any consideration of preserving the natural environment. Today, climate change is a challenge on a different scale, quite apart from questions of ecological versus economic

legitimacy. The result is that people perceive an inherently new hierarchy of priorities, where economic issues cannot be promoted to the detriment of environmental or social issues. In terms of Jevons's thinking, this means that questions of social justice and redistribution are highly relevant in any discussion of ecological taxation. In contrast, arguments focused on competitiveness and administrative efficiency carry less weight in today's context despite being much discussed. This misconception does not mean that no pertinent argument can be made against ecological taxation, only that some of the discourse should be relegated to a lower tier as it does not adequately reflect the changed historical context.

Ultimately, William Stanley Jevons's pioneering thinking on ecological taxation is enlightening in several ways in that it reveals the persistence of discussions that pit environmental measures against the population's economic development and underscores the major historical changes that have altered the nature of some objectives. Although Jevons established a clear link between the energy burden and the debt burden, both concerns are often discussed separately today. Lastly, it is enlightening in that it shows the pertinence of certain arguments based on the environmental challenge, which is not the same today as in Jevons's day. It is not at all certain that competitiveness or purchasing power are threatened to the same degree by carbon taxes as they were by coal taxes. If we had to take away just one lesson from Jevons's pioneering work, it would no doubt be that any decision about energy and the environment requires "boldness" (Jevons 1866, 365). Yet political will too often fails in the face of challenges that overwhelm all of us individually but to which we need to find answers collectively.

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